



Soil health tools of the trade

SRA'S SOIL HEALTH PROJECT BRINGS TOGETHER PEOPLE WITH DIFFERENT SKILLS TO DEVELOP KNOWLEDGE, MATERIALS AND TOOLS THAT WILL ADVANCE THE WAY IMPROVED FARMING SYSTEMS PRACTICES CAN BE IMPLEMENTED. THE INDUSTRY CAN CAPTURE MAJOR PRODUCTIVITY GAINS BY IMPROVING THE HEALTH OF OUR SOILS.

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Soil health describes the physical, chemical and biological conditions of soil and its capacity to support a profitable and sustainable farm. Soil is the foundation of a healthy and productive sugarcane crop. While cane is a hardy plant, it needs healthy soil to maximise its yield potential across the crop cycle.

Cane soils can deteriorate due to intensive farming practices over several decades with compaction and low levels of organic matter as big contributors.

Soil health relates to the whole farming system and is a consequence of almost all the actions on farm. Science can bridge the gap between soil health and farming systems. As a result of current work underway by SRA and our partners, we are working on tools that will give growers the confidence to adopt practices that improve soil health and overall profitability.

The Sugar Yield Decline Joint Venture (SYDJV) provided sound advice on soil health but the take up of the recommended practices was low. The four main practices were fallow rotation crops and continuous cropping; zonal tillage; controlled traffic; and crop residue/organic matter retention.

To build on the knowledge from the SYDJV, a project was developed to assist sugarcane growers with the adoption of these practices and improve their soils. This five-year project started in 2017 at sites across the Burdekin and Herbert and will validate these practice changes.

This data will enable researchers to identify a subset of key soil health indicators that can be used to identify soil constraints and measure soil health. A soil health toolbox of measuring instruments is currently being developed for extension providers and growers so they can make a quick assessment of paddock soil health. This will enable the industry to quickly identify and address soil health constraints such as low pH, sodic horizons, compaction, and low labile carbon as well as understanding the impact of farming practices on soil health.

The project is one of a number which come under the umbrella of the SRA Soil Health Program, a ten year commitment by SRA to invest in and conduct research, development and extension activities into industry soil health constraints and provide solutions to optimise yield and profitability outcomes for growers.

Having an understanding of what a healthy soil is, combined with better testing and measurement tools, will offer advantages in farming sugarcane including delivering yield gains.

The soil health extension kit is comprised of tools with an accompanying instruction manual so the user can compare sustainable management practices, monitor changes in soil health over time and identify soil constraints.

Each kit will contain items such as a pH/EC meter; sodium meter; pocket colorimeter – labile carbon; bulk density rings; water infiltration rings; penetrometer; split soil auger (for roots and sub-soil sampling); and worm sampling rings.

We are currently developing protocols for each instrument to produce instructions on how to use the kit and interpret the results. All of the tools are being used by the research team, and the protocols are being developed and therefore not yet ready for release to industry advisors.

"It's very important to have confidence in the measurements being generated," said Anthony Curro, SRA Regional Coordinator.

The toolbox will be ready for trial by industry advisors by the end of 2018 and will undergo further development and refinement. It is expected the kit in its final form will be released in 2019.

Armed with the kit, growers and extension officers will identify the key soil constraints that are limiting productivity; develop an action plan to fix the problems; modify the farming

system in some way and then check up on the farm to confirm the benefits have been obtained. Extension officers will visit, take a soil sample, and test it on the spot so you can evaluate the soil health and get answers straight way. This also means you don't need to purchase the equipment.

One standout soil health indicator is labile carbon. The team is finalising a protocol of sampling labile carbon in the field which takes 15 minutes. This rapid turnover carbon is a prime food source for soil biology and plays an important role in nutrient cycling, water retention, root health, and soil structure. High labile carbon soils promote a diverse biological ecosystem, which greatly increases the resilience of the soil to act as a buffer against soil borne diseases.

Labile carbon is fertiliser for your soil biology.

It is a sensitive indicator of soil biological health and is rapid and easy to measure.

Labile carbon has fast turnover and it is punching above its weight in terms of contribution to the soil health and crop health.

The good news is that growers can improve the level of labile carbon in their soils. For example, mill mud, particularly applied sub surface, and legume rotational crops have a beneficial effect to labile carbon and positive effects on biology and overall soil health.

While some may argue that mill mud is expensive to transport from the mill, the question for growers is do they see enough bang for their buck and, yes, for some it will be too costly if they are located a distance away from the mill.

Tillage is another factor that continues to have a huge impact on soil structure, and promotes compaction in the plough-pan horizon. The more you till, the worse off for the physical structure of your soil. The implications to the soil biology due to the loss of factors such as soil fungi are huge.

Some paddocks will not function without the use of laser levelling for effective irrigation and drainage. While we acknowledge that laser levelling can cause a loss of carbon from the farming system, we also acknowledge that a farm will not function unless it is on the correct slope with the correct irrigation and drainage. In these circumstances, we should try to remediate the loss of carbon in the system through the use of mill mud and planting of fallow legume crops.

These practices need to be looked at from a whole farming system approach, not just space and fallow. These changes can impact the economics of your farming practices because your root health will result in extra ratoons and lower pathogen loads will reduce the time spent in the tractor. ■

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(Over page top) SRA Research Technician, Robert Verrall, with tools from the Soil Health Toolbox testing soil in Macknade. (Over page bottom) Each tool in the Soil Health Toolbox measures for a specific soil constraint that is holding back productivity.